

What is claimed is:

1. A synchronization establishing apparatus in a spectrum spread communication system, comprising:
  - a search section which calculates correlation values from a received spectrum spread signal,
  - 5 calculates power values as addition values of symbols corresponding to said correlation values and power addition values of said power values, and selects larger ones of said power addition values to output together with timing data corresponding to said
  - 10 selected larger power addition values, one of said symbols and said power values being corrected in phase based on phase change quantities;
    - a frequency offset estimating section which estimates frequency offsets from one of said
    - 15 correlation values and said power values and demodulation timing data, and calculates said phase change quantities from the estimated frequency offsets to output to said search section; and
    - a demodulation path selecting section which
    - 20 selects path timings from said timing data based on said selected larger power addition values and outputs said demodulation timing data indicative of said path timings to said frequency offset estimating section.
2. The synchronization establishing apparatus according to claim 1, wherein said search section

comprises:

a synchronizing circuit which calculates said  
5 correlation values from said received spectrum spread  
signal to output to said frequency offset estimating  
section, and calculates said power values as in-phase  
addition values of said symbols corresponding to said  
correlation values while correcting phases of said  
10 symbols based on said phase change quantities; and  
a path search section which calculates said  
power addition values of said power values, and  
selects larger ones of said power addition values to  
output together with said timing data corresponding to  
15 said selected larger power addition values.

3. The synchronization establishing apparatus  
according to claim 2, wherein said synchronizing  
circuit comprises:

a signal converting section which converts  
5 said received spectrum spread signal into a baseband  
signal;  
a sampling and holding circuit which samples  
and holds said baseband signal to output a sampling  
signal;  
10 a correlation unit which calculates said  
correlation values from said sampling signal; and  
a symbol integrating unit which inversely  
modulates said symbols with predetermined data and

calculates said power values as said in-phase addition  
15 values of said symbols values while correcting phases  
of said symbols based on said phase change quantities.

4. The synchronization establishing apparatus  
according to claim 1, wherein said search section  
comprises:

a synchronizing circuit which calculates said  
5 correlation values from said received spectrum spread  
signal to output to said frequency offset estimating  
section, and calculates said power values of said  
symbols;

a slot integrating unit which calculates said  
10 power addition values of said power values while  
correcting phases of said symbols based on said phase  
change quantities; and

a path search section which selects larger  
ones of said power addition values to output together  
15 with said timing data corresponding to said selected  
larger power addition values.

5. The synchronization establishing apparatus  
according to claim 4, wherein said synchronizing  
circuit comprises:

a signal converting section which converts  
5 said received spectrum spread signal into a baseband  
signal;

a sampling and holding circuit which samples and holds said baseband signal to output a sampling signal;

10 an integrating unit which calculates said correlation values from said sampling signal; and

a symbol integrating unit which inversely modulates said symbols with predetermined data and calculates said power values of said symbols.

6. A method of establishing synchronization in a spectrum spread communication system, comprising:

(a) calculating correlation values from a received spectrum spread signal;

5 (b) calculating power values as addition values of symbols corresponding to said correlation values and power addition values of said power values, one of said symbols and said power values being corrected in phase based on phase change quantities;

10 (c) selecting larger ones of said power addition values to output together with timing data corresponding to said selected larger power addition values;

(d) estimating frequency offsets from one of 15 said correlation values and said power values and demodulation timing data to produce said phase change quantities from the estimated frequency offsets; and

(e) selecting path timings from said timing

data based on said selected larger power addition  
20 values such that said demodulation timing data  
indicative of said path timings are produced.

7. The method according to claim 6/ wherein said  
(d) estimating includes:

estimating said frequency offsets from said  
correlation values and demodulation timing data to  
5 produce said phase change quantities from the  
estimated frequency offsets,

said (b) calculating includes:

adding said symbols corresponding to said  
correlation values while correcting phases of said  
10 symbols based on said phase change quantities, to  
produce said power values; and

adding said power values to produce said  
power addition values.

8. The method according to claim 6/ wherein said  
(d) estimating includes:

estimating said frequency offsets from said  
power values and demodulation timing data to produce  
5 said phase change quantities from the estimated  
frequency offsets,

said (b) calculating includes:

adding said symbols corresponding to said  
correlation values to produce said power values; and

10           adding said power values while correcting  
phases of said power values based on said phase change  
quantities, to produce said power addition values.

9.           A receiver in a spectrum spread communication  
system, comprising:

              m (m is an integer larger than 1) search  
section, each of which calculates correlation values  
5 from a received spectrum spread signal, calculates  
power values as addition values of symbols  
corresponding to said correlation values while  
correcting phases of said symbols based on phase  
change quantities, calculates power addition values of  
10 said power values, and selects larger ones of said  
power addition values to output together with timing  
data corresponding to said selected larger power  
addition values;

              a frequency offset estimating section which  
15 estimates frequency offsets from said correlation  
values for a corresponding one of said m search  
sections and demodulation timing data and calculates  
said phase change quantities from the estimated  
frequency offsets to output to said corresponding  
20 search section; and

              a demodulation path selecting section which  
selects path timings from said timing data based on  
said selected larger power addition values for each of

said m search sections and outputs said demodulation  
25 timing data indicative of said path timings to said  
frequency offset estimating section corresponding to  
said search section.

10. The receiver according to claim 9/ wherein  
each of said m search sections comprises:

a synchronizing circuit which calculates said  
correlation values from said received spectrum spread  
5 signal to output to said frequency offset estimating  
section, and calculates said power values as in-phase  
addition values of said symbols corresponding to said  
correlation values while correcting phases of said  
symbols based on said phase change quantities; and

10 a path search section which calculates said  
power addition values of said power values, and  
selects larger ones of said power addition values to  
output together with said timing data corresponding to  
said selected larger power addition values.

11. The receiver according to claim 10/ wherein  
said synchronizing circuit comprises:

a signal converting section which converts  
said received spectrum spread signal into a baseband  
5 signal;

a sampling and holding circuit which samples  
and holds said baseband signal to output a sampling

signal;

a correlation unit which calculates said  
10 correlation values from said sampling signal; and  
a symbol integrating unit which inversely  
modulates said symbols with predetermined data and  
calculates said power values as said in-phase addition  
values of said symbols values while correcting phases  
15 of said symbols based on said phase change quantities.

12. A receiver in a spectrum spread communication  
system, comprising:

m (m is an integer larger than 1) search  
section, each of which calculates correlation values  
5 from a received spectrum spread signal, calculates  
power values as addition values of symbols  
corresponding to said correlation values, calculates  
power addition values of said power values while  
correcting phases of said power values based on phase  
10 change quantities, and selects larger ones of said  
power addition values to output together with timing  
data corresponding to said selected larger power  
addition values;

a frequency offset estimating section which  
15 estimates frequency offsets from said correlation  
values for a corresponding one of said m search  
sections and demodulation timing data and calculates  
said phase change quantities from the estimated



frequency offsets to output to said corresponding  
20 search section; and

a demodulation path selecting section which  
selects path timings from said timing data based on  
said selected larger power addition values for each of  
said m search sections and outputs said demodulation  
25 timing data indicative of said path timings to said  
frequency offset estimating section corresponding to  
said search section.

13. The receiver according to claim 12, wherein  
each of said m search sections comprises:

a synchronizing circuit which calculates said  
correlation values from said received spectrum spread  
5 signal to output to said frequency offset estimating  
section, calculates said power values of said symbols;

a slot integrating unit which calculates said  
power addition values of said power values while  
correcting phases of said power values based on said  
10 phase change quantities; and

a path search section which selects larger  
ones of said power addition values to output together  
with said timing data corresponding to said selected  
larger power addition values.

14. The receiver according to claim 13, wherein  
said synchronizing circuit comprises:

a signal converting section which converts  
said received spectrum spread signal into a baseband  
5 signal;

a sampling and holding circuit which samples  
and holds said baseband signal to output a sampling  
signal;

a correlation unit which calculates said  
10 correlation values from said sampling signal; and

a symbol integrating unit which inversely  
modulates said symbols with predetermined data and  
calculates said power values as said in-phase addition  
values of said symbols.